
BEEF SPECIES: COW-CALF AND BULL

0915 (W047) Pregnant beef heifers categorized by residual feed intake measured in adolescence exhibit differential intake and feeding behaviors when fed a restricted diet.

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Selection for residual feed intake (RFI) in cattle will bring about changes in metabolism and physiology that are not explicitly known. We appraised feed intake and feeding behavior in heifers, characterized by a range of RFI, when fed two different planes of nutrition from d 30 to 150 of pregnancy. Sixty-nine purebred Angus heifers, with RFI_f (RFI corrected for fat, ave = 0.047, SD = 0.7678) measured in adolescence, entered a GrowSafe automated feed intake recording system after confirmation of pregnancy at 30 d post artificial insemination (AI). Heifers were divided randomly yet equally in terms of RFI_f, weight at start of test (SOT), and SOT rib and rump fat, into two diet-groups. Heifers received a ration formulated to allow gain of either 0.5 kg/d (L-diet) or 0.7 kg/d (H-diet). Rations were fed until 150 d of pregnancy and were adjusted periodically to account for heifer and fetal growth plus decreasing fall temperatures. Heifer weight, as well as rib and rump fat were measured approximately once every 4 wk, and individual feed intake and feeding behavior was continuously measured by GrowSafe. All weight and fat measurements, feed intake and behavior were analyzed using PROC GLM in SAS 9.0, with RFI_f, diet (H- or L-diet), RFI_f*diet, and AI (first or second) included in the model. There were no significant differences due to RFI_f, diet, or their interaction on SOT weight, or SOT rib and rump fat. By end of test (EOT), significant diet effects were seen on EOT weight, both EOT rib and rump fat, and ADG during the feed trial ($P < 0.01$), with heifers consuming H-diet displaying higher weights and fat measurements, but no effect of RFI_f was detected. However, significant diet and RFI_f effects were detected in average daily intake, feeding duration and head-down time ($P < 0.05$), where heifers with lower RFI_f ate less, had a lower average daily feeding duration and head-down time, than those with higher RFI_f. Therefore, regardless of diet consumed and under limiting nutritional conditions, low RFI_f pregnant heifers

ate less, yet maintained the same growth and body condition when compared to high RFI_f pregnant heifers. This result is important as RFI_f is typically measured on virgin animals and under ad-libitum conditions. If selection for RFI is to become mainstream in the cattle industry, investigating the performance of high and low RFI animals in different nutritional environments and physiological conditions is important.

Key Words: behavior, cattle, residual feed intake

0916 (W048) Physiological stress response of heifers divergently ranked for residual feed intake following a bovine corticotrophin releasing hormone challenge.

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The objective of this study was to determine whether beef heifers previously ranked on the basis of phenotypic RFI differed in their physiological stress response to an exogenous corticotrophin-releasing hormone (CRH) challenge. Yearling Limousin × Friesian heifers ($n = 86$) were ranked on phenotypic RFI. The 15 highest [mean 0.47 kg/d; high RFI] and 15 lowest [mean -0.53 kg/d; Low RFI] ranking animals were used for this study. To facilitate intensive blood collection heifers were fitted aseptically with indwelling jugular catheters on d -1. To examine the response of the adrenal cortex, a standardised dose of bovine CRH (bCRH; 0.3 µg/kg BW) was administered (Day 0). Before heifers undergoing bCRH challenge dexamethasone (20 µg/kg BW) was administered intramuscularly on day -1. Baseline blood samples were collected into tubes containing lithium heparin as an anti-coagulant at -60 and 0 min before the administration of dexamethasone. On Day 0, serial heparinised blood samples were collected at -40, -20, 0, 20, 40, 60, 80, 100, 120, 150, 180, 210, 240, 270, 330, and 390 min relative to the time of CRH administration (0 min) for plasma cortisol and DHEA concentrations. Data were analyzed using a repeated measures mixed models ANOVA (PROC MIXED) in SAS incorporating terms for RFI group, sample time and their interaction, as appropriate. Residual feed intake ranged from -1.27 to 1.87 kg DM/d. (SD = 0.93) representing a mean daily difference of 3.14 kg DM in feed consumed between the most and least efficient animals. Low RFI animals consumed 18% less feed than animals with high-RFI. Least square means for RFI and F:G were higher ($P < 0.05$) for high RFI than for low RFI animals. Neither a RFI × sampling time interaction nor a direct effect of RFI was detected for DHEA, cortisol or cortisol:DHEA concentrations in response to the exogenous bCRH challenge. No difference ($P > 0.10$) in median plasma area under the curve (AUC) for cortisol, DHEA or cortisol:DHEA was observed between the two

RFI groups. The maximum concentration and change in cortisol and DHEA concentrations owing to CRH were not different between the high and low RFI phenotypes. Furthermore, across animals, AUC, maximum concentration or change in cortisol or DHEA concentrations were not associated ($P > 0.10$) with DMI, F:G or RFI co-efficients. These data suggest that the responsiveness of the hypothalamic-pituitary-adrenal axis is unlikely to contribute to appreciable variation in the efficiency feed utilisation of cattle.

Key Words: feed efficiency, stress, cortisol

0917 (W049) Relationship of metabolic hormones, urea, and body composition with feed efficiency in Angus heifers carrying different genetic markers under grazing condition. A. I. Trujillo^{*1}, A. Casal¹, M. Carriquiry¹, and P. Chilibroste², ¹*Facultad de Agronomía, Universidad de la República, Montevideo, Uruguay*, ²*Facultad de Agronomía, Universidad de la República, Paysandu, Uruguay*.

The objective of this research was to explore potential physiological indicators of residual feed intake (RFI) in two beef cattle groups carrying simultaneously different genetic markers (GM) associated with low and high RFI (V and C groups, respectively) under grazing conditions. Twelve Angus heifers of each group (aged 369 ± 28 d, 294 ± 37.4 kg of body weight (BW), at the beginning of the experiment) ranked by BW and RFI in a previous feedlot experiment were randomly assigned to four paddocks of an unrestricted high-quality temperate pasture during 57 d. Concentrations of serum IGF-1, leptin, and urea at d 1, 21, and 53, ultrasound subcutaneous fat thickness at d 1 and 56, (SFT), subcutaneous 12/13th rib fat depth, intramuscular fat percentage and eye muscle area at d 40 (SBF, IMF and EMA, respectively) as well as estimation of body composition by the urea dilution technique at d 56 (whole body fat content–BF% and whole body protein content–BCP%) were obtained. Data were assessed using a mixed model. Concentrations of IGF-1 did not differ between GM but tended ($P < 0.078$) to be affected by the interaction between GM and sampling date, being lower in V than in C group at d 1 (274.3 vs. 321.5 ± 22.6 mm/L). Leptin concentrations tended ($P = 0.09$) to be greater for V than C group (2.80 vs. 2.33 ± 0.24 mm/L, respectively) and were neither affected by sampling date nor by their interaction. Serum urea concentrations were not affected by GM nor by its interaction with sampling date. The EMA, SFT, SBF, IMF and % BCP did not differ between GM, however estimated BF % and BF:BCP ratio were greater ($P = 0.035$, $P = 0.038$, respectively) in V than in C group (23.7 vs. $20.6 \pm 1.29\%$, 1.64 vs. 1.39 ± 0.12). Leptin concentration and BF % were both negatively correlated ($r = -0.43$, $p = 0.037$ and $r = -0.38$, $p = 0.071$, respectively) with RFI. Our data suggest that leptin concentration and BF % could be used to screen for more efficient females under grazing conditions. Other experiments should be designed to

uncover additional indicators underlying variation in RFI under grazing conditions.

Key Words: residual feed intake, beef cattle, pasture

0918 (W050) Effects of maternal plane of nutrition during mid- or late gestation on beef cow performance and progeny performance through weaning. T. B. Wilson^{*} and D. W. Shike, *University of Illinois, Urbana*.

Objectives were to investigate the effects of maternal plane of nutrition during mid- or late gestation on cow BW, BCS, and lactation as well as calf growth through weaning. Spring-calving, multiparous cows ($n = 68$; BW = 631 ± 80 kg) were utilized in a 3×2 factorial design that included three planes of nutrition formulated to provide (limit-fed diet = 52% corn silage, 24% soy hulls, and 24% alfalfa haylage): 100% NRC energy and protein requirement (REQ), 70% NRC requirement (70%REQ), or 130% NRC requirement (130%REQ) applied during two stages of gestation: mid-gestation (MID, 196 ± 14 to 113 ± 14 d prepartum) or late gestation (LATE, 92 ± 6 to 9 ± 6 d prepartum). After treatment period, cows were fed a common diet formulated to meet NRC requirements. Treatment period ADG and BCS changes were greater ($P \leq 0.01$) for cows fed 130%REQ than 70%REQ, with REQ being intermediate. There was an interaction ($P = 0.04$) between plane of nutrition and stage of gestation in which treatment was applied for calf birth BW. When treatments were applied during mid-gestation, birth BW was greater ($P \leq 0.04$) for calves born to cows fed 70%REQ compared to calves from cows fed REQ or 130%REQ; however, there were no differences ($P \geq 0.65$) during late gestation. Milk production, at 101 ± 11 d postpartum and weaning (198 ± 11 d postpartum), was not affected ($P \geq 0.19$) by plane of nutrition. Calf weaning BW was not affected ($P \geq 0.17$) by plane of nutrition or stage of gestation in which treatments were applied. Ultrasound backfat at 101 ± 11 d of age was greater ($P \leq 0.04$) for calves born to REQ vs. 70%REQ or 130%REQ cows, yet was not different ($P = 0.12$) at weaning. Ultrasound marbling score was not affected ($P \geq 0.35$) by plane of nutrition, but was greater ($P \leq 0.01$) for calves born to MID cows at 101 ± 11 d of age. Placing cows on diverging nutritional planes either during mid- or late gestation had profound effects on cow ADG and BCS change and may lead to altered calf body composition through weaning but did not affect calf weaning weight or pre-weaning ADG. There were no effects of an interaction between maternal plane of nutrition and stage of gestation in which treatments were applied, except for increased birth BW of calves born to cows that were nutrient restricted during mid-gestation.

Key Words: beef cow, gestational nutrition, fetal programming

0919 (W051) Effects of prepartum plane of nutrition during mid- or late gestation on beef cow BW, BCS, and preimplantation embryo recovery.

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Objectives were to evaluate potential effects of prepartum plane of nutrition during mid- or late-gestation on BW, BCS, and preimplantation embryo recovery. Spring-calving, multiparous beef cows ($n = 60$; BW = 657 ± 70 kg) were utilized in a 3×2 factorial arrangement that included three planes of nutrition formulated to provide (limit-fed diet = 52% corn silage, 24% soybean hulls, and 24% alfalfa haylage): 100% NRC energy and protein requirement (REQ), 70% NRC requirement (70%REQ) or 130% NRC requirement (130%REQ) fed during two stages of gestation: mid-gestation (Mid, 195 ± 5 to 112 ± 5 d prepartum) or late-gestation (Late, 91 ± 4 to 8 ± 4 d prepartum). After treatment period, cows were fed a common diet formulated to meet NRC requirements. All cows had their estrous cycles pre-synchronized with two injections (14 d apart) of PGF $_{2\alpha}$ beginning 43 ± 4 d postpartum. A 7 d co-sync protocol was used to synchronize cows. A 4-regimen of Folltropin (FSH) was administered to induce superovulation and GnRH was given 12 h and 24 h before breeding. Cattle were flushed 84 ± 4 d postpartum, and 7-d embryos were harvested. Cyclicity was assessed by P $_4$ analysis at 43 ± 4 and 57 ± 4 d postpartum. Statistical analysis was performed using the MIXED and GLIMMIX procedures in SAS. Nutritional plane did not affect ($P = 0.61$) percentage of cows cycling by 57 ± 4 d postpartum (70%REQ, 15.8%; REQ, 27.3%; 130%REQ, 21.1%). The Logistic model revealed that cows fed nutritional treatments during late-gestation had lower odds for cyclicity than cows fed nutritional treatments in mid-gestation [odds ratio (OR) = 0.18; $P = 0.02$]. Cows fed 130%REQ had greater ($P \leq 0.03$) BW than REQ and 70%REQ cows, and cows fed 130%REQ and REQ had greater ($P \leq 0.04$) BCS than cows fed 70%REQ at time of breeding. There was a plane of nutrition by stage of gestation interaction ($P < 0.01$) for total embryos recovered. When nutritional treatments were applied during mid-gestation, a greater number of total embryos were recovered from cows fed 70%REQ than from cows fed REQ and cows fed 130%REQ were intermediate; however, when nutritional treatments were applied during late-gestation, a greater number of total embryos were recovered from cows fed 70%REQ and REQ than cows fed 130%REQ. In conclusion, prepartum plane of nutrition during mid- or late-gestation affects cow BW, BCS, and total embryos recovered, but did not affect cyclicity in cows before breeding.

Key Words: embryo, gestational nutrition, reproduction

0920 (W052) Effects of breed, sex, parity, birth year, and birth season on body weight traits for five local cattle breeds and crossbreds in arid region of Punjab, Pakistan.

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The objectives of the present study were to study the effects of breed, sex, parity, year of birth, and season of birth on birth weight, weaning weight, and yearling weight recorded on 796 calves born between 1996 and 2008. This included offspring from five local cattle breeds (Dhanni, Lohani, Dajal, Red Sindhi, Cholistani) and crossbreds (Holstein or Jersey crosses) maintained at Barani Livestock Production Research Institute (BLPRI, Attock, Punjab, Pakistan). The data were analyzed using a mixed linear model with PROC MIXED (SAS). Overall means \pm SD (obtained using PROC MEANS) of birth, weaning, and yearling weights were 18.59 ± 2.54 kg, 73.85 ± 19.04 kg and 113.65 ± 30.33 kg, respectively. All three growth traits varied with breed, sex, parity of dam and season of birth and year of birth. However, the birth weight did not vary among seasons ($P = 0.16$), and weaning weight did not vary between dam parity ($P = 0.29$). The calves of Lohani cattle (a short stature breed) had the lightest birth weights (16.6 kg) as compared to other breeds and crossbreds (> 18 kg). The heaviest weaning weights (93.0 kg) were found in calves from the Dajal breed, followed by weaning weights for Dhanni (79.9 kg), Cholistani (74.0 kg), Red Sindhi (71.9 kg), and Lohani (66.1 kg). The heaviest yearling weights were found in Dajal calves (147.4 kg), while the lowest yearling weights were found in Lohani calves (98.0 kg). Yearling weights for all other breeds ranged from 111 to 118 kg. Overall, birth, weaning and yearling weights were greater in male vs. female calves. The calves born to first parity cows had lighter birth and yearling weights, and similar weaning weights as compared to calves from later parity cows. Spring born calves had heavier weaning weights (79.2 kg) than summer born calves (71.7 kg). Summer born calves had lighter yearling weight (109.3 kg) than calves born in other seasons (118–120 kg). Additionally, when data were analyzed using a model considering all factors as random, breed explained the most variation for all three body weight traits. The observed between breed variation for growth indicates an untapped potential for beef production. Moreover, results from the present study have useful implications for breed improvement and management decisions for cattle breeds being raised under arid conditions.

Key Words: body weights, cattle breeds, arid region

0921 (W053) Effect of rumen protected carbohydrate supplementation on performance and plasma glucose concentrations in growing heifers. J. P. Russi¹, P. Davies², N. DiLorenzo³, and A. E. Relling⁴, ¹Facultad de Cs Veterinarias, UNLP, La Plata, Buenos Aires, Argentina, ²INTA Gral. Villegas, General Villegas, Argentina, ³University of Florida, Marianna, ⁴Facultad de Ciencias Veterinarias UNLP, La Plata, Buenos Aires, Argentina.

The objective of this study was to evaluate the inclusion of a ruminally protected carbohydrate (RUPCA) on performance and blood metabolites in growing heifers. One hundred thirty-five cross-bred heifers (136 ± 14kg) were used in an 84-d experiment. Heifers were blocked according to initial BW and placed (nine per pen) into 15 dirt floor pens (12 × 50 m). Heifers within blocks were randomly assigned to one of three treatments: T0) Control (100% basal supplement), T1) 50% RUPCA and 50% basal supplement, and T2) 100% RUPCA. Diets were (DM basis): 38.8% corn silage, 41.5% dry corn (finely ground), 2% minerals and vitamins mix, and 17.7% supplement (58.1% soybean meal, 39.9% carbohydrates, 2% urea, and 1% minerals). RUPCA and the basal supplement consisted of the same ingredients, differing on the processing of the carbohydrate (i.e., protected or not from ruminal degradation). Heifers had ad libitum access to feed and water during the study. Body weights were measured on d 0, 21, 42, 63, and 84. Dry matter intakes were measured every 7 d from d 21 when the adaptation to the diets finished. Blood samples were taken every 21 d and analyzed for glucose concentration. Back fat on the 12th Rib (BF) was measured on d 1 and 84. Data was analyzed as a randomized complete block design with repeated measures using a mixed model in SAS. There were no significant differences ($P > 0.10$) amongst treatments on initial BW, final BW, or ADG; however, cattle fed T1 had the lowest DMI ($P < 0.01$) and the greatest G:F ratio ($P < 0.02$). There were no differences in glucose concentrations ($P > 0.96$) or BF on d 84 ($P > 0.72$). In conclusion, including RUPCA at a rate of 8.87% of the diet DM improved G:F ratio by reducing DMI and not affecting ADG.

Key Words: carbohydrates, ruminally protected

Table 0921.

	Treatments			SEM	P-Value
	T0	T1	T2		
Initial BW, kg	136.5	136.3	136.3	0.5	0.95
Final BW, kg	236.1	232.8	237.0	2.25	0.37
DMI, kg/d	6.73 ^a	5.79 ^b	6.73 ^a	0.087	< 0.001
ADG, kg	1.185	1.145	1.196	0.092	0.72
G:F	0.175 ^a	0.212 ^b	0.189 ^a	0.009	0.02
Glucose, mg/dL	95.9	97.2	96.8	31.03	0.96
84 d Back fat measurement, mm	5.55	5.63	5.53	0.09	0.72

^{a,b} Means without common superscript differ ($P < 0.05$). Final del formulario.

0922 (W054) Evaluation of forage soybean, with and without pearl millet, as an alternative forage for developing beef replacement heifers. E. Taylor^{*1}, P. J. Gunn², L. A. Horstman³, R. L. Atkinson⁴, K. D. Johnson³, and R. P. Lemenager³, ¹Purdue University, Lafayette, IN, ²Iowa State University, Ames, ³Purdue University, West Lafayette, IN, ⁴Southern Illinois University–Carbondale, Carbondale.

Angus-Simmental beef replacement heifers ($n = 90$; BW = 366 kg ± 25; BCS = 5.53 ± 0.35) were used to evaluate the effects of feeding forage soybean-based silages on heifer BW, BCS, follicular growth and fertility. At 65 d before timed-artificial insemination (TAI), heifers were allotted by breed, BCS and BW into three replications per treatment to receive one of three diets; 1) alfalfa haylage (CON), 2) soybean silage (SB) or 3) soybean and pearl millet silage (SBPM). All diets were formulated to meet or exceed nutrient requirements (NRC, 2000) of replacement beef heifers with a targeted gain of 0.79 kg/d. Estrous cyclicity status of heifers was determined by two samples of blood taken 10 d apart before initiation of estrous synchronization and analyzed for circulating progesterone concentrations. Heifers were synchronized for ovulation using a 5-d Co-Synch + CIDR protocol and were observed for estrus on 12-h intervals between CIDR removal and TAI. Diameter of the largest antral follicle was determined at time of AI via ultrasonography. Bulls were placed with heifers 10 d after TAI for remainder of the breeding season. Pregnancy diagnosis was accomplished via ultrasonography 35 and 66 d post-TAI, respectively, for TAI and overall breeding season pregnancy. Data were analyzed with the GLIMMIX and PROC MIXEDs of SAS for categorical and continuous variables, respectively. Final BW (avg. 414 kg; $P \geq .10$) and BCS (avg. 5.28; $P \geq .07$) for the heifers were similar among treatments. The proportion of heifers showing estrus before TAI (51%) and interval to estrus in those females that exhibited estrus (55 h) did not differ among treatments ($P \geq .11$). Ovulatory follicle diameter (avg. 11.7 mm) was not different ($P > .31$) among treatments. No differences were noted in pregnancy rate to TAI (avg. = 48%; $P > .19$) or overall breeding season (avg. = 93%; $P > .99$) pregnancy rates. In summary, forage soybean-based silages, with and without pearl millet, are acceptable alternative forages for developing replacement beef heifers.

Key Words: forage, beef, heifer

0923 (W055) Plasma glucose concentration, subcutaneous fat thickness, and puberty attainment in Nellore heifers treated with recombinant bovine somatotropin. G. Nogueira^{*1}, D. Giraldo-Arana¹, J. S. Souza¹, M. A. Maioli¹, M. C. V. Miguel¹, R. S. Cipriano², T. Sayuri Aguiar³, D. M. Pinheiro¹, and R. F. Cooke⁴, ¹UNESP, Araçatuba, Brazil, ²UniSalesiano, Araçatuba, Brazil, ³UNESP, Araçatuba, Brazil, ⁴Oregon State University–EOARC Burns, Burns.

In previous research, we observed that Nellore heifers that attained precocious puberty had greater plasma IGF-I but similar plasma leptin concentrations compared with cohorts that attained puberty later. Hence, this experiment evaluated the effects of bovine ST treatment as an alternative to increase plasma IGF-I concentrations on plasma glucose concentrations, body fat accretion, and puberty attainment of Nellore heifers. Thirty-one heifers were distributed in groups Treated ($n = 16$; 348 ± 52 d of age; 259 ± 49 kg of initial BW) or Control ($n = 15$; 356 ± 40 d of age; 260 ± 38 kg of BW). For 10 mo, Treated heifers received 250 mg of somatotropin zinc every 14 d, whereas Control heifers concurrently received 2.5 mL of saline. All heifers were maintained on a single pasture and exposed to a teaser bull with a neck-marker device to identify mounted heifers. Ovarian ultrasonography was conducted every 14 d to determine corpus luteum presence. Every 2 mo, rump and back fat thickness were also estimated via carcass ultrasonography whereas blood samples were collected. Heifers were considered pubertal when teaser bull activity was observed and a corpus luteum was detected. Age at puberty and fat thickness were analyzed by unpaired *t* test, whereas plasma glucose concentrations were analyzed by the Mann Whitney test of GraphPad PRISM. No treatment effects were detected ($P \geq 0.30$) for puberty attainment, nor heifer age and BW at puberty. More specifically, seven Treated heifers (593 d of age and 394 kg of BW at puberty) and seven Control heifers (599 d of age and 411 kg of BW at puberty) reached puberty during the experiment. Back fat thickness was greater ($P = 0.03$) in Control compared with Treated heifers at 22 mo of age (5.0 vs. 4.0 mm, respectively). Rump fat thickness was also greater ($P \leq 0.05$) in Control compared with Treated heifers at 16 mo (5.0 vs. 4.4 mm), 18 mo (5.0 vs. 4.4 mm), 20 mo (5.5 vs. 4.8 mm), and 22 mo of age (5.8 vs. 4.6 mm). No treatment differences were detected ($P = 0.46$) for plasma glucose concentration (90 vs. 89 mg/dL for Treated and Control heifers, respectively). In summary, Nellore heifers administered bovine ST at the experimental conditions utilized herein had decreased subcutaneous fat accretion, but similar plasma glucose concentrations as well as BW and age at puberty compared with cohorts receiving saline.

Key Words: bovine ST, heifers, Nellore, puberty

0924 (W056) Effect of dried distillers grains with solubles and dried citrus pulp supplementation on metabolic and reproductive parameters of Charolais beef cows grazing buffelgrass in Northeastern México. E. Garza Brenner^{*1}, H. Bernal Barragán^{1,2}, E. Gutiérrez Ornelas^{1,2}, F. Sánchez Dávila¹, A. S. Juárez Reyes^{2,3}, and E. Olivares Sáenz¹, ¹Universidad Autónoma de Nuevo León, San Nicolás de los Garza, México, ²Red Internacional de Nutrición y Alimentación en Rumiantes, Durango, México, ³Universidad Juárez del Estado de Durango, México.

The objective of this study was to evaluate body weight, body condition and reproductive performance of Charolais beef cows ($n = 32$) grazing buffelgrass (*Cenchrus ciliaris* L., 7.0% crude protein (CP) and 56.6% NDF) supplemented with two isocaloric agroindustrial byproducts. Cows were blocked by age, parity, body condition score (initial BCS was 4.75) and body weight, and randomly assigned to individually receive 1 kg/d of either dried distillers grains with solubles (DDGS; 30.3% CP, 2.65 Mcal ME/kg DM), or a 50:50 mixture of DDGS and dried citrus pulp (DDGS:DCP; 17.45% CP, 2.82 Mcal ME/kg DM) during a 30-d breeding period, applying the standard 9-d synchronization protocol utilizing a controlled internal drug-release (CIDR) device and an additional 8-d CIDR resynchronization beginning on the fifth day after artificial insemination. Body weight (BW), and body condition score (BCS) were registered, and blood samples were collected via coccygeal venipuncture on d 0, 9, 16, 24, and 30, and analyzed to determine Urea Nitrogen (BUN, colorimetrically), and plasma Progesterone (ELISA) using commercial kits. Estrus appearance was registered by visual observation, and pregnancy diagnosis was confirmed using transrectal ultrasonography. Data were analyzed using two-way ANOVA (for BW, BCS, BUN and progesterone), and Chi-square test (for reproductive traits). Cows receiving DDGS:DCP were heavier on d 16 (487 vs. 464 kg) and d 24 (500 vs. 485 kg, $P < 0.05$) than those supplemented with DDGS, whereas BCS (mean = 5.0) was not different between treatments ($P > 0.05$). Cows supplemented with DDGS had increased ($P = 0.01$) BUN values on d 9 and 24 (12.8 vs. 8.3 and 11.3 vs. 9.4 mg/dL), compared to cows supplemented with DDGS:DCP. No differences were found between treatments in plasma progesterone concentrations ($P > 0.05$). Cows receiving DDGS:DCP presented 20 estrus, whereas cows receiving DDGS showed 13 estrus ($P < 0.05$). Differences in pregnancy rate (56.2% for DDGS:DCP; 68.7% for DDGS) were not significant ($P > 0.05$) between treatments. In summary, supplementing DDGS:DCP to Charolais beef cows grazing buffelgrass increased body weight and estrus appearance, but not BCS and pregnancy rate compared with DDGS supplementation.

Key Words: beef cows, dried citrus pulp, dried distillers grains with solubles

0925 (W057) Evaluation of anthelmintic resistance of intestinal parasitic nematodes in heifers in south central Nebraska. S. A. Jones¹, C. C. Chase*¹, R. Cortinas², D. Griffin³, L. A. Kuehn¹, K. Shuck³, K. Whitman³, R. G. Tait, Jr.¹, and J. W. Keele⁴,

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Internal parasitic nematodes impact the livestock industry through losses in reproductive efficiency, rate of gain, carcass quality, milk production, or immune response. The frequent use of anthelmintics with drug formulations in which chemical activity persists for long periods selects for worm resistance and has contributed to parasite resistance to multiple classes of dewormers. We evaluated the effectiveness of two classes of anthelmintics, avermectin and fenbendazole, on fecal parasite load in yearling heifers grazing on irrigated pastures in south central Nebraska. Both of these anthelmintics have been used historically at U.S. MARC. Hence, a reduction in efficacy for these two historically used anthelmintic classes would be indicative of resistance. Spring-born heifers ($n = 1015$, average BW = 295 kg) were grazed on irrigated, mixed legume and cool season grass irrigated paddocks starting April 15, 2013. Heifers were managed in four pastures and fecal egg counts (FEC) 10% of each grazing group (25 hd minimum) were monitored weekly using a modified Wisconsin fecal floatation technique. When average FEC numbers for the sample reached > 25 eggs per 2 g, heifers in the group were weighed, fecal sampled for FEC (pre-treatment), and randomly assigned to one of three treatment groups (no dewormer; Avermax injectable (ivermectin) at 1 mL/50kg BW subcutaneously; or Safeguard 10% Suspension (fenbendazole) at 2.3 mL/45.5 kg BW orally) by age and breed stratification. Treatments occurred July 16, 17, 26, and 27, 2013. Animals were sampled and FEC counts were obtained 2 wk later (post-treatment). The percentage of zeros for FEC was 4.5 for pre-treatment and 39.0 for post-treatment. Because of the high proportion of zero valued FEC, pre-treatment and post-treatment FEC were analyzed assuming a zero inflated negative binomial distribution. The zero inflated negative binomial model fit better than the standard negative binomial for post-treatment FEC ($P = 0.0026$) but not for pre-treatment FEC ($P = 0.363$). The effects of pasture (or breed) and treatment interacted ($P = 1.13 \times 10^{-17}$) with treatment having larger effect in pastures with higher FEC pre-treatment. Considering main effects, pasture affected FEC both pre- ($P = 4.44 \times 10^{-17}$) and post-treatment ($P = 9.41 \times 10^{-12}$). Treating animals with either Avermax or Safeguard reduced FEC ($P = 1.25 \times 10^{-94}$), and Safeguard's effect was greater than Avermax ($P = 9.73 \times 10^{-13}$). Treatment with anthelmintics is efficacious and has greater impact when parasitic load is greater. High efficacy of treat-

ment indicates that little or no resistance has accumulated in parasitic nematode populations at USMARC.

Key Words: parasitic intestinal nematodes, cattle, fecal egg counts, resistance, althelmintics

0926 (W058) Effect of an injectable trace mineral on pregnancy rate of virgin heifers when synchronized using the 5-d Co-Synch plus CIDR or 14-d CIDR-PG protocol. C. J. Brasche*¹, J. B. Hall², and M. E. Drewnoski¹, ¹University of Idaho, Moscow, ²University of Idaho, Carmen.

This study examined the effect of using a commercially available injectable trace mineral (TMI) on the reproductive performance of virgin heifers. Angus-crossbred heifers ($n = 109$, BW = 358 ± 3.7 kg) were blocked by weight and randomly assigned to treatment in a 2×2 factorial of either TMI containing copper, manganese, selenium, and zinc or no injection (CON) and one of two synchronization protocols, either a 14-d CIDR-PG protocol or a 5-d Co-Synch plus CIDR protocol. The objective of this study was to determine the effects of TMI before fixed time artificial insemination (AI) on conception to AI as well as the effects on overall pregnancy rate after exposure to bulls. Thirty-3 d before AI, heifers receiving TMI were given Multimin90 (0.57 mL/45.5 kg of BW). For the 14-d CIDR-PG protocol, a controlled internal drug release device (CIDR) was inserted 33 d before insemination and removed 14 d later. Prostaglandin (PG) was injected 16 d after CIDR removal and heifers were artificially inseminated 73 h later. For the 5-d protocol, a CIDR was inserted 7 d before AI and an injection of gonadotropin-releasing-hormone (GnRH) was given. Five d later the CIDR was removed, and a PG injection was given. A second PG injection was given 5.6 h later, and heifers were artificial inseminated 55 h after the last PG injection. All heifers received an injection of GnRH concurrently with AI and exposed to bulls 9 d post AI. Conception was determined using ultrasonography at 55 and 105 d post-AI. At 105 d post-AI, there was a synchronization protocol by TMI interaction for rate of heifers conceiving to AI ($P = 0.04$). However, conception to AI within the 5-d Co-Synch plus CIDR protocol (CON 66.0% vs. TMI 52.0%) and within the 14-d CIDR-PG protocol (CON 55.0% vs. TMI 75.0%) did not differ ($P \geq 0.13$) between the CON and TMI. There was no interaction ($P = 0.18$) between synchronization protocol and TMI for overall pregnancy rate after timed-AI and natural service. However there was significant effect of TMI ($P = 0.02$) on overall pregnancy rate with heifers receiving TMI (93.0%) having a greater ($P = 0.02$) pregnancy rate than the CON (83.0%) after AI and exposure to bulls. This data suggests that use of a TMI 30 d before the breeding season may improve reproductive performance of virgin heifers.

Key Words: heifer, injectable trace mineral, reproduction

0927 (W059) Oral supplementation with selenium for young Brangus bulls raised in pasture: seminal quality in fresh and frozen semen. T. B. Castaldeli*, L. K. Hatamoto-Zervoudakis, B. H. Tsuneda, J. T. Zervoudakis, W. A. D. S. Marinho, F. A. D. P. D. B. Arguello, M. F. Duarte Junior, P. P. Tsuneda, and R. D. Almeida, *Federal University of Mato Grosso, Cuiaba, Brazil.*

Cryopreservation stimulates production of free radicals and oxidative stress. The selenium (cofactor of enzyme glutathione peroxidase) acts as antioxidant protecting sperm membrane of lipid peroxidation and against consequent loss of function. The aim of this study was to evaluate oral selenium supplementation on semen quality of fresh and cryopreserved semen from young Brangus bulls raised in pastures in central Brazil. Sixteen Brangus bulls (5/8 Angus, 3/8 Zebu) with 24 mo and 472 kg of body weight on continuous grazing with daily concentrate supplementation by 75 d were used. The treatments were: GC- control (no added selenium in concentrated supplementation), GS- selenium (concentrated with addition of 0.1 mg Se/kg of dry matter intake (DMI)). After collection were evaluated sperm motility (MOT), sperm vigor (VIG), sperm viability (SVIAB), spermatid membrane integrity (SMI) and acrosomal membrane integrity (AMI) and triple stain (TS). Then semen was diluted and cryopreserved in TRIS-egg yolk citrate extender with 4% of glycerol. Thawing was performed in water bath at 37°C for 30 s. After thawing the samples, aliquots to evaluation of MOT, VIG, SVIAB, SMI, AMI, and TS were removed. Experiment was conducted in a completely randomized design. Data were analyzed by ANOVA with significance level of 5%. Supplementation with selenium improved SMI ($P = 0.0480$) in fresh semen (CG 26.71 ± 2.89 vs. 37.45 ± 4.14 GS) and frozen semen (GC 8.75 ± 1.42 vs. GS 9.90 ± 1.59). Selenium supplementation did not alter other parameters evaluated ($P > 0.05$). Studies on selenium supplementation with qualitative and quantitative parameters of bovine semen are rare. Thus, further research should be done to better understand effect of selenium on reproductive function. Oral supplementation with selenium concentration of 0.1 mg/kg DMI for young Brangus bulls raised on pasture does not alter seminal parameters traditionally evaluated in fresh and cryopreserved semen, but improves integrity of sperm plasmatic membrane.

Key Words: antioxidant, cryopreservation, sperm membrane.

0928 (W060) use of vitamin c combined to pentoxifylline and fertility in cattle after cryopreservation. R. D. Almeida*, L. K. Hatamoto-Zervoudakis, M. F. Duarte Junior, J. T. Zervoudakis, P. P. Tsuneda, A. L. C. Rezende Fraga, F. A. D. P. D. B. Arguello, T. B. Castaldeli, and F. M. Wingert, *Federal University of Mato Grosso, Cuiaba, Brazil.*

The process of frozen of the sperm provides a resting state of the cell, reducing energetic expenditures and the production of catabolites, preserving the cell structure and the fertilizing capacity of sperm. In contrast to a loss of quality (40 to 50%) occurs if compared to fresh semen, resulting from cooling processes freezing and thawing. These losses occur due to decreased sperm viability or damage to the functional capacity of the surviving sperm. Vitamin C is considered an antioxidant extracellular fluid, acting by preventing the formation of lipid hydroperoxide in plasma lipoproteins, and protecting the lipids in cell membranes while maintaining their structural integrity and viability during the cryopreservation process. Pentoxifylline is a methylxanthine derivative compound, the same class as caffeine and has the characteristic of inhibiting adenosine cyclic monophosphate (AMP) phosphodiesterase, causing an increase in the intracellular concentration of cyclic adenosine monophosphate (cAMP), activating the adenylyl cyclase which causes the activation of protein kinase-dependent and phosphorylation of sperm proteins, which are essential in initiation and maintenance of sperm movement. The objective of the experiment was to evaluate the use of vitamin C combined with pentoxifylline in the middle of cryopreservation of bovine semen that reduces the damage caused by oxidative stress and preserves sperm quality after thawing. We used 10 Nellore bulls with age/weight average of 31 mo and 632 kg, subjected to a semi-intensive system, raised on pasture *Brachiaria brizantha* cv., kept in sexual rest. One ejaculate was collected by electrical stimulation, which was analyzed after diluted in extender TRIS-citrate-yolk-glycerol (4%), divided into two parts: a part of the control (without additives), and the other supplemented with vitamin C (0.45 mg/mL) + pentoxifylline (1 mg/mL). Afterward, the samples were cooled and frozen and stored until the time of analysis. After thawing, the samples were evaluated for motility and movement characteristics, plasma membrane integrity and acrosome, mitochondrial activity and level of lipid peroxidation (TBARS). The supplementation of cryopreservation did not alter ($P > 0.05$) the mitochondrial activity, acrosomal integrity, and concentration of spontaneous and induced TBARS. Based on the results, it is concluded that the addition of vitamin C + pentoxifylline was not effective in reducing the damage caused by oxidative stress and cryopreservation of bovine semen samples.

Key Words: antioxidant, fertility, oxidative stress